THE CAROLINA ENGINEER

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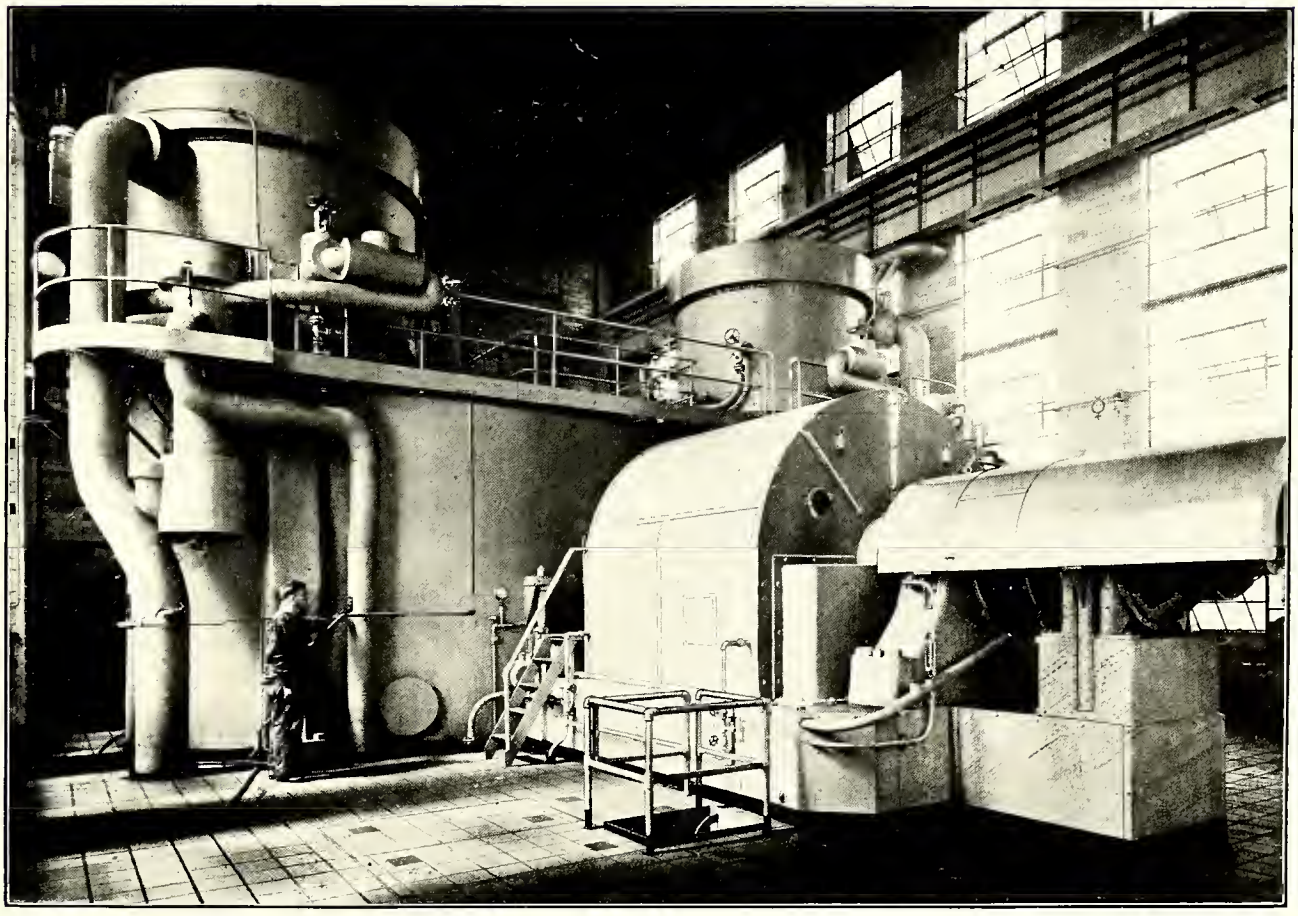
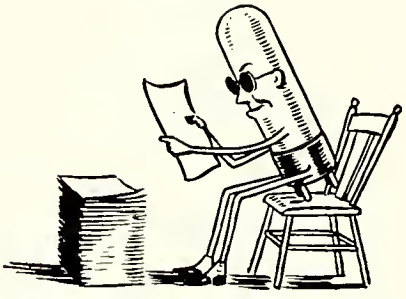


MERCURY VAPOR TURBINE

Volume 3 ~ *Number 3*

MARCH, 1935

G-E *Campus News*



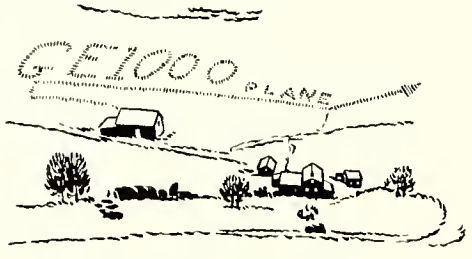
GLASSES FOR ELECTRIC EYES

Electric eyes are wearing colored glasses and doing a new job. As a result of strict NRA code requirements, the paper industry had to find a rigid means of classifying different qualities of paper. The Institute of Paper Chemistry found that as far as white book papers were concerned, the percentage of light they reflected was an indication of their quality.

The General Electric general engineering laboratory built the necessary device—an instrument which relies on the scrutiny of two phototubes in series to measure the coefficient of reflection. This is an exceedingly delicate task, as the matter of a small percentage of reflectivity determines the price and quality of a paper.

Here's where the glasses come in. To do certain jobs right, the electric eyes had to don different colored glass screens in the form of a filter and lens arrangement. It wasn't that they were getting old; they just needed a little assistance.

J. L. Michaelson, Northwest Missouri State Teachers College, '28, is G-E engineer in charge of building these instruments.



"GE-1000"

When, after a two-day search, a rescue plane finally located the lost transport plane which "mushed down" on a lonely Adirondack peak a couple of months ago, General Electric radio engineers rushed an emergency portable short-wave radio station into the mountain country to help in co-ordinating land and air rescue operations. The disabled ship was in the center of a wilderness, miles from the nearest means of communication. The radio expedition, however, managed to set up its equipment in a cabin at the end of a one-track automobile trail, only four miles from the scene of the mishap. There, designated as station "GE-1000" at the request of the airline operators, the equipment was used as an emergency unit in the airline's radio system. The General Electric engineers co-operated in communicating with the planes that guided the rescue parties toward the stranded fliers. They also helped send back news of the rescue, directly to owners of short-wave receiving sets, and through a rebroadcast by WGY, the General Electric station at Schenectady, to other listeners.

W. J. Purcell, chief engineer of WGY; W. R. David, U. of Kentucky, '19; E. H. Fritschel, Iowa State, '26; G. W. Fyler, Yale, '29; R. H. Williamson, Iowa State, '28; R. W. Orth, Minnesota, '30; G. M. Brown, Washington State, '29; and R. A. Lash, Ohio Northern, '29, comprised the General Electric radio expedition.

TURBINE BIOGRAPHY

A turbine can now write its own biography, with the aid of recording instruments recently developed in the General Electric general engineering laboratory.

These sensitive devices were developed for the supervision of large turbines from a point remote from the scene of operation. The instruments measure and record shaft eccentricity, bearing vibration, shell expansion, and interference of rubbing or rotating parts. They provide the operator with an indication and a permanent record, on paper, of mechanical performance throughout the starting period and subsequent running time.

C. D. Grecntree, Alabama Poly, '28; A. V. Mershon, Pratt Institute, '13; and M. S. Mead, Case School of Applied Science, '23, of the General Electric general engineering laboratory, worked on the instruments.

96-130DH

GENERAL ELECTRIC

WALTER W. KING, JR.
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THE CAROLINA ENGINEER

The Professional Journal of the School of Engineering

UNIVERSITY OF NORTH CAROLINA

VOLUME III MARCH, 1935 NUMBER 3

THE COVER

This huge mercury vapor turbine, the second installation of its kind in the world, is part of the equipment of the Kearny Generating Station of the Public Service Electric and Gas Company, New Jersey. It is a 20,000 kilowatt unit and produces in addition 375,000 pounds of steam per hour which is sufficient to generate about 33,000 kilowatts in the main steam turbines of the station. The boiler is equipped to burn either fuel oil or bituminous coal (lump or pulverized) or both simultaneously. Approximately 300,000 pounds of mercury are utilized in the system.

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(Cut, Courtesy Public Service and Gas Company, New Jersey)

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THE CAROLINA ENGINEER

VOLUME III MARCH, 1935 NUMBER 3

The Value of Economics to the Engineer

By ERICH W. ZIMMERMANN, Ph.D.,
Kenan Professor of Economics

Editor's Note: This talk was given at the fall tapping of Tau Beta Pi in Gerrard Hall, November 15, 1934.

The subject on which I wish to talk to you tonight is very wide; it can be approached from many angles. I shall not attempt to treat it exhaustively or cover all of its phases. This involves the matter of choice. I shall, therefore, first mention one or two things which I have consciously ruled out and shall then point out those phases which I shall try to touch upon.

DR. ZIMMERMANN

In the first place, I want to assure you that when I speak to you about the value of economics to the engineer I am not in the least implying that the engineer needs economics necessarily more than the economist needs to know something about engineering. If I could, I should like to talk to economists on the value of engineering to them. I think it was John Stuart Mill who once said that he is indeed a poor economist who is nothing but an economist. I merely wish to stress the vital importance of interdepartmental and interprofessional cross-fertilization and of the necessity of synthesizing the findings of related arts and sciences into that rounded-out knowledge and understanding which alone suffices those who face the highly complex issues of the modern economic and social world.

In the second place, I want to make it quite clear that this is not to be a sales talk on behalf of the School of Commerce, advertising such merchandise as Economics 11, Ecoonmics 161, Commerce 51, etc. If it were intended as such it would be, I am sure, both improperly timed, and in rather poor taste.

This therefore is not to be an enumeration of specific subjects coming under the general heading of economics which might prove of special interest and value to the engineer who wishes to supplement his vocational training. I take it for granted that intelligent students of engineering readily perceive the value of such vocational courses as accounting, personnel management, business organization, business administration, etc., without my going into detail to develop their practical usefulness.

I shall now try to make clear which phases I do wish to develop so far as it is possible to do so within the narrow limits of time at my disposal. The fact that I have chosen particular aspects in preference to others naturally implies that I am inclined to consider those phases to be intrinsically more important than those which I wish to disregard. I have two distinct phases in mind. One lies in the realm of methodology, of ways of thinking, etc. The other lies in the realm of subjective attitudes more specifically in the field of social ethics. To put it concretely I wish to discuss, first of all, the value of economics as a lesson in the limitation of exact Science in the realm of social phenomena, and, secondly, I wish to stress the value of economics as a stimulant of social consciousness.

In order to make clear what I mean by the value of economics as a lesson in the limitation as a result of which I myself have become aware of a seemingly basic difference, a wide cleavage which tends to separate the ways of thinking of the engineer and the economist. The first instance I wish to recite is that of a professor of mining engineering at one of the great eastern universities. This well known authority has attracted wide attention by a number of studies by which he wishes to determine the output of work in different countries. This scientist has undertaken painstakingly to assemble statistical data on the number of human beings engaged in work in different countries, on the number of horsepowers installed, the number of tons of coal and barrels of petroleum consumed, kilowatt hours of electricity generated, etc., and has succeeded in drawing a fairly accurate picture of the amount of work done by various agencies, both organisms and mechanisms. So

far so good. Such a study legitimately falls within the confines of the engineer who is most familiar with the terminology of power using industry and is well equipped to find a reasonable common denominator for coolies and skilled mechanics, for horses and mules, inventors, tidal waves, dynamoes, gasoline motors, engineers, and diesel engines.

Unfortunately the eminent engineer then proceeds with advancing a social theory of extraordinary boldness and sweeping comprehensiveness. He argues that economic well-being tends to be proportionate to energy expenditure. He goes so far as to accuse the economist of depriving him of a fair chance to demonstrate that an accurate correlation exists between these two factors: energy expenditure and economic well-being. He blames the economist for not providing him with a definition of well-being sufficiently concrete, tangible, and accurate to be used on his slide rule. There you have a clear-cut illustration of what I had in mind when I spoke to you about the value of economics as an object lesson in the limitation of exact science in the realm of social phenomena. Even a cursory acquaintance with economic principles will convince the intelligent student that there are in the field of economics concepts which, because of their very nature, successfully and permanently resist slide-rule treatment. The slide-rule that can accurately measure the well-being of an Indian fakir sitting on a high pedestal or on a neatly arranged collection of sharp nails has not and cannot be invented. If it could be invented it seems reasonably certain that that same slide rule could not with equal accuracy measure the well-being of people living under entirely different civilizations and expecting from life satisfactions wholly different from those which the Hindu fanatic aspires to obtain.

Let me give you another illustration. Some years ago, I had the privilege of calling on an engineer whose task at that time was to find out whether or not the expenditure of several hundred thousand dollars on a breakwater would pay. When I asked him by what procedure he determined the economic justification of the expenditure, he replied that he had a general rule by which he and his colleagues always decided such matters. They would study the statistics of port traffic over the period of the five preceding years. If these statistics revealed a trend of growth exceeding a certain arbitrary fixed minimum the breakwater or whatever else was under consideration would be built — if not, the breakwater would not be built. All seemed very simple. The economist hearing this reply is naturally struck by the almost callous disregard of a large number of factors which would immediately come to his mind as being thoroughly relevant to the proper interpretation of such traffic statistics. He is apt to be amazed to find that the same person who might spend hours to calculate, perhaps to the second or third decimal point, the strains and stresses of T-beams, girders, pilings, etc., is satisfied with what to him appears an unusually crude method of appraisal of factors lying in the economic field.

One may reply that all that is to be said about this particular case is that the individual engineer was negligent or that the organization to which he belonged had not properly instructed him; that, in short, it was merely an incident of no importance and by no means symptomatic. To this I would answer as follows. In the first place, I can and shall add other instances which will show that such procedure does seem to be rather symptomatic, and, secondly, that it is perhaps inevitable that the person trained in dealing with dead substances and inanimate energies develops techniques which just because they serve well in his own field are bound to serve poorly in an entirely different field—the field of economic and social phenomena.

Permit me to cite one or more additional examples. You are aware of the fact that ex-President Hoover, an eminent engineer, strongly favored and probably still favors the construction of the Great Lakes-St. Lawrence Tidewater Channel. Having done some work in the fields of ocean shipping and internal waterways, I was particularly interested in this project. I, therefore, wrote to the Federal Government for copies of the studies made to determine the economic feasibility of this great engineering project. Much to my surprise, I received a relatively small pamphlet containing some undoubtedly interesting statements and statistics bearing on the problem but as amazingly scanty as the rule of thumb was crude which the engineer planning the breakwater was using. Evidently I was not the only economist who was struck by this state of affairs; for I soon learned that the Brookings Institution of Washington, D. C., had authorized the expenditure of a large sum of money to finance a somewhat more detailed study of the traffic potentialities of the new waterway. This Institution sent agents to firms whose manufacturing establishments were located in the Great Lakes area. These agents were instructed to inquire what quantities of what commodities these firms expected to send out or bring in by way of the new waterway. With few exceptions the answer received was about as follows: "We are in favor of the new waterway but only as a general public improvement not for ourselves; for we shall not be in a position to utilize the waterway. It so

happens that the nature of the commodities which we bring in or send out precludes their being shipped by water. They must move by rail." Incidentally it might be mentioned that the almost universally favorable attitude toward the new project might be traced to an exceedingly active, persistent, and well managed propaganda organization which for years had canvassed the affected territory in favor of the construction of the Great Lakes-St. Lawrence Tidewater Channel.

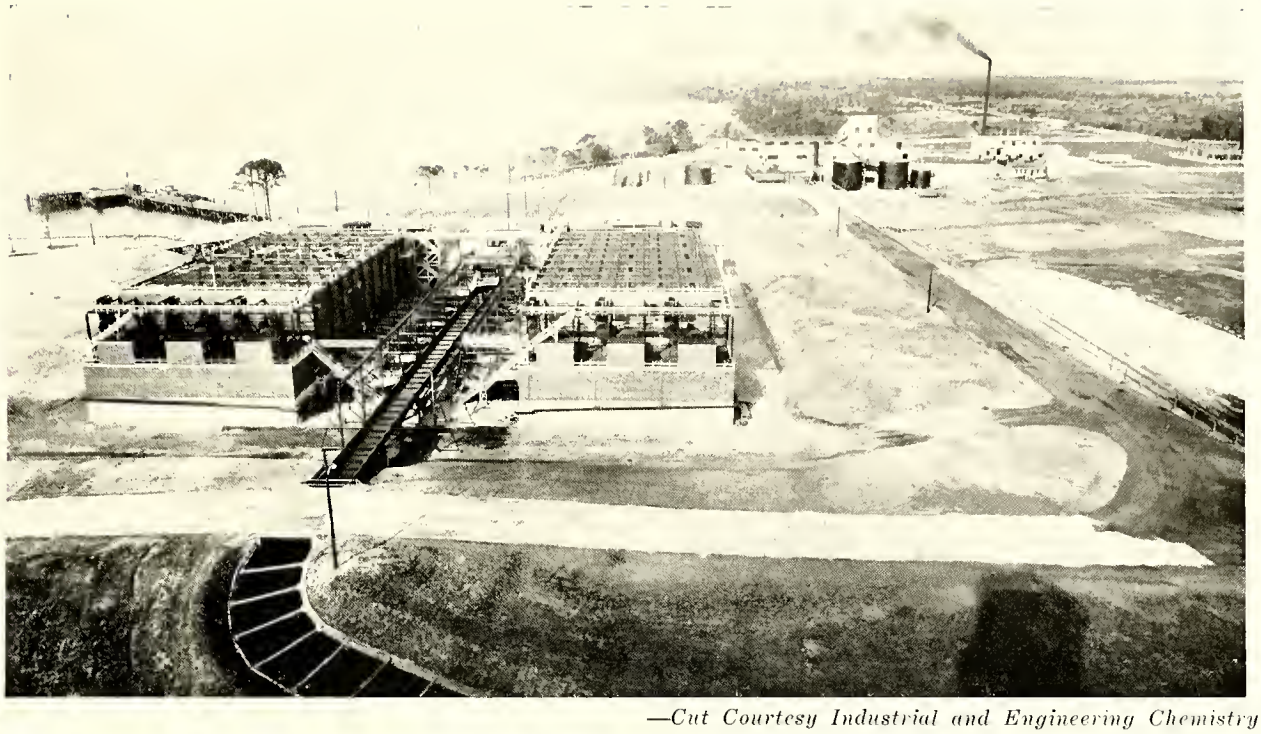
Perhaps it might be replied that such a waterway would serve agricultural producers and exporters of agricultural products rather than importing and exporting manufacturers. Let us briefly analyze this claim. I listened to a speech of an ex-governor of Iowa on the blessings which were bound to accrue to the entire corn and wheat belts adjacent or tributary to the Great Lakes. I am afraid we economists are too skeptical. To over-enthusiastic politicians and engineers we are apt to appear as intolerable kill-joys. I must admit that the ex-governor did not succeed in convincing me with his arguments. He had it all figured out in black and white that every exporter of wheat, and, as he implied therefrom, every farmer raising wheat for export, would receive after completion of the Great Lakes-St. Lawrence Tidewater Channel probably at least 2½ cents a bushel more for his crops than he received before. The economist cannot concur in this conclusion. He finds that improvements in the technical apparatus which links sources of supplies to their markets do not accrue to all participants alike but tend to accrue only to rigidly organized minorities occupying strategic positions such as grain dealers, millers, packers, etc., and fail to accrue to those engaged in more competitive enterprises. The building of a vast engineering project such as the Great Lakes-St. Lawrence Tidewater Channel would undoubtedly give employment to much labor, would turn most welcome contracts into the hands of engineering firms, would result in valuable orders for raw materials to makers of cement, steel, and producers of coal and petroleum; but whether its completion would benefit the masses of agriculturists in adjacent or tributary territories is more than doubtful. That the New York State Barge Canal, another magnificent engineering enterprise, similarly benefited the relatively small group of realtors, contractors, engineering firms, etc., who pushed it through goes without saying, but that it represents one of the most colossal wastes of public funds has been amply demonstrated by the experience of the last few decades and has been ably exposed by a former governor of the State of New York.

Another example: a few years ago the United States Army engineers reported on the feasibility of constructing a huge dam somewhere in the State of Washington. The gist of the report was this. Viewed purely as a power project the dam does not justify the expenditures involved. Since, however, the dam would at the same time serve to irrigate vast stretches of fertile land its construction was justified. It is to the lasting credit of the Republican Secretary of Agriculture then in office that he sent a most emphatic letter to the officer in charge of the United States corps of engineers in which he bluntly stated that what American agriculture needed was less land under cultivation rather than more land under cultivation; that an irrigation project of that magnitude had to be viewed not as an isolated regional project but as an integral part of the entire American agricultural set-up and that, viewed in that light, its completion should be resisted rather than encouraged by agriculture.

I believe that the examples which I have cited are adequate not only to make clear what I am driving at but also to prove that what I wish to point out is not a mere incident of no general significance but is rather symptomatic. I, therefore, turn to the second point I wish to make, namely, that there seems to be something implied or involved in the engineering approach which tends to encourage inadequate regard for any but the most obvious and superficial economic aspects involved. As I stated before, it is possible that this phenomenon is explained by the fact that the engineer on the whole must deal with dead substances and inanimate energies which can be measured and tested accurately and that, on the other hand, the economist and sociologist face issues necessarily involving a much larger percentage of imponderables and intangibles. When, therefore, the engineer approaches the economic aspects of his engineering projects he does so with slide-rule in hand and the logarithmic table under his arm. To be sure, there is a limited sphere lying within the wide realm of economics which can be successfully tackled with slide-rule and logarithmic table. But the engineer is not likely to get into that narrow zone. He is much more apt to face economic problems of a nature requiring a more flexible procedure.

That is one thing. Another possible explanation might be this. The engineer is essentially a doer. He wants to make things, he wants to see great things done, he waxes enthusiastic at the sight of colossal bridges, gigantic dams, enormous power plants, endless highways. His is the realm of action. Technics deal with the possible ways by which things can be accomplished, with the practicability of executing ideas, with the *how* of human action. Economics, on the other

(*Continued on page Thirteen*)



—*Cut Courtesy Industrial and Engineering Chemistry*

THE BROMINE EXTRACTION PLANT OF THE ETHYL-DOW CHEMICAL COMPANY, WILMINGTON, N. C.

Bromine from the Ocean

By JACK CRUTCHFIELD

Of all the industries of North Carolina, the one which has attracted most attention in the last year is the bromine-extraction plant of the Ethyl-Dow Chemical Company near Wilmington. Curiously enough, however, it was not the extraction of bromine from sea water, but the mention of the fact that the waste water leaving the plant contains 2 1-3 parts of gold to one billion parts of water that most firmly caught the public fancy. Newspapers all over the country emphasized the possibilities of gold mining from the ocean in the future. They reasoned that if bromine, existing in the ocean in 67 parts per million, can be profitably extracted; then it is just a matter of time before a practicable process for the extraction of gold will be perfected.

The fact that a raw material practically unlimited in supply has been successfully tapped as a source of one of the important chemical commodities is indeed fascinating. The fact that this same raw material contains all the elements known to man, and that processes, although not economically feasible at the present time, have been developed for the removal of a number of these elements stimulates the imagination of both chemist and layman. It is reasonable to suspect that, with the extraction of bromine a success, researches will be conducted to develop processes for the profitable extraction of the other elements which the sea water contains.

The large increase in the use of ethylene dibromide in conjunction with tetraethyl lead in the treatment of gasoline motor fuel is responsible for the research and subsequent developments in the bromine-from-the-sea process. Heretofore practically all of the bromine produced in this country came from natural brines and from bitterns resulting from the evaporation of sea water. With the increase in consumption from two million pounds in 1924 to nine million pounds in 1931, it became evident that new sources of bromine must be developed, or production from the natural brines would have to be stepped up considerably. Rather than upset its balance of production with all the attendant by-products from an increased use of natural brines, the Dow Chemical Company, chief producers of bromine in the country, in conjunction with the Ethyl Gasoline Corporation, producers of Ethyl fluid, directed its efforts toward the economical extraction of bromine from the sea.

The process, developed under the direction of Leroy C. Stewart, director of research of Dow Chemical Company, consists briefly of replacing the bromine with chlorine, blowing the bromine out with air, removing it in absorption towers with a soda ash solution, treating the resulting liquor with sulfuric acid to liberate the bromine, steaming the bromine out of solution to be condensed and mixed with ethylene gas to make ethylene dibromide.

After a thorough study of the eastern and

southern coast lines of the country it was decided to locate the plant on the long, narrow promontory of land in North Carolina at the mouth of the Cape Fear River. This site satisfactorily fulfilled the requisites for the location of the plant: namely, that the sea water must not be diluted by fresh water streams, that the disposal of the sea water from which the bromine had been extracted must be effected without dilution of the water entering the process, and that no appreciable quantities of industrial waste be present in the water entering the process. The sea water enters the plant from the intake on the ocean through a canal and a large steel flume, and is discharged through exit flumes into the river which carries it into the ocean about 12 miles south of the intake.

The extraction of the bromine takes place in two identical units, each of which consists of a blowing-out tower, in which a counter-current stream of air removes the bromine from acidified and chlorinated sea water, and an absorption tower, in which the bromine is removed from the air by means of a soda ash solution. Both blowing-out towers and absorption towers are built of brick and have concrete floors and foundations. The blowing-out towers are partitioned into narrow chambers which are filled with wood packing and extend the full width of the structure. These chambers are operated in parallel. Each absorption tower is divided into nine chambers which are connected in series so that the air passes in succession through each absorbing chamber and out through the suction fans. The bromine extraction units are shown in the figure at the head of the article.

In each unit the sea water, previously acidified with sulfuric acid and oxidized by the addition of chlorine, is pumped to the top of the blowing-out tower, and as it trickles down through the wood packing of the tower a counter-current stream of air blows the liberated bromine out at the top. The air-bromine mixture is then conducted through the absorption towers in series where descending streams of the soda ash solution remove the bromine from the air, forming sodium bromide and bromate according to the reaction: $3\ Na_2CO_3 + 3\ Br_2 = 5\ NaBr + NaBrO_3 + 3\ CO_2$ The dissolving liquor is circulated through the towers counter-current to the air stream so that a solution of the desired concentration is obtained from the chamber nearest the absorption tower. This solution is pumped to storage tanks at the proper intervals.

Bromine is liberated from the bromide-bromate solution by treating the liquor with sulfuric acid; then the free bromine is vaporized by the application of heat, and the vapors are condensed into pure liquid bromine. In the ethylene plant, beyond the extraction units in the figure, ethylene gas is made by passing ethyl alcohol vapor over heated kaolin catalyst. The bromine is then allowed to react with the ethylene gas to form ethylene dibromide, the finished product.

The plant was constructed under the direction of A. P. Beutel of the Dow Chemical Company at a cost of $3,500,000. Operation was started in January 1934, and the plant is now treating 37,000,000 gallons of sea water with the extraction of 15,000 pounds of bromine daily.

ENGINEERING LABORATORIES ON STUDENT-FACULTY DAY

By LUTHER BRITT

Perhaps the most important feature of the Student-Faculty Day program was the display of exhibits by the various departments of the University. The members of the Engineering School recall a most successful day of entertaining visitors in their laboratories—a success which was indicated both by the number of visitors who came, and by the way in which they gave their attention to the exhibits.

The Chemical Engineering Department demonstrated: (1) High temperature measurement; (2) Humidity measurement; (3) Oil and gas analysis; (4) Coal analysis; (5) Commercial filtration, using the Oliver continuous filter; (6) Gasoline analysis.

The civil, electrical, and mechanical engineering exhibits were under the direction of T. P. Noe, Jr. A faculty member and two students from each department handled departmental exhibits effectively.

The Civil Engineering Laboratories showed: (1) In Sanitary Engineering, the demonstration of routine water analysis, and examples of design reports submitted by engineering students; (2) In the Materials Testing Laboratory, a demonstration of a beam test in the 200,000 lb. testing machine; (3) Highway Materials Laboratory; (4) Surveying equipment; (5) In engineering drawing, drawings made by students, and equipment.

Visitors to the Electrical Engineering Laboratories were entertained by: (1) The radio room; (2) Standards and measurements; (3) The dynamo laboratory; (4) High voltage display; (5) Transformer demonstration.

The Mechanical Engineering Laboratory presented: (1) Steam and internal combustion engines; (2) Aerodynamics Laboratory; (3) Testing of fuels and lubricants; (4) Engines and miscellaneous equipment.

Emergency Relief Projects on University Campus

By Wendell Dunbar

For the last two years relief work has been carried on in many forms at the University. Headquarters were established in the old Chi Phi house behind the music building, and the entire program for the Orange County Emergency Relief Administration has been directed from there. Five major projects were begun, and at the present time two have been completed. The projects consist of: the conditioning of the old Chi Phi house, the paving of certain campus drives, the construction of a new athletic field, the renovation and fireproofing of Person Hall, and the reconstruction of the University tennis courts.

Construction of Tennis Courts

The old Chi Phi house was completely remodeled last fall. It was painted both inside and out, steam heat was installed, and its floors and stairs were repaired and replaced. The sum of $1,422 was spent in making it suitable for the headquarters of the E.R.A.

The street surfacing project called for the paving of 76,500 sq. yd. of streets and sidewalks in Chapel Hill. This included work on the campus drives and walks which has been in progress since last summer. The drives in front of Bynum Gymnasium, Steele Dormitory, around South Building, in front of the Buildings Department, and beside Old East Dormitory have been paved. These drives are a great improvement over the old clay drives which became rutted and muddy after every rain. In town the streets leading toward Gimghoul Castle, Rosemary Street, Pittsboro Street, and others were paved. The entire project is now finished at a cost of $21,754.

The largest project undertaken by the local administration is the construction of a new athletic field on the site of the old intramural football field just beyond the Tin Can. Work was begun on this job almost a year ago, but because of insufficient funds it ceased last summer. Since proper drains were not installed before the work was stopped, several fills and excavations washed out, and serious damage was done to the new project. Work was resumed last quarter, however, when funds were received for the completion of the field. Approximately 100 men are now at work constantly, and the scene is the center of activity of the relief work. At present the quarter-mile track has almost been completed, and the foundation for the stadium is being laid. A rip saw has been set up on the scene, and forms for the stadium, which will seat 7,000 people, are rapidly being produced. The project will necessitate the expenditure of $130,000, and will be ready for use by next year. The field, consisting of three athletic fields and one track, will be one of the finest in the South.

The renovation and fireproofing of Person Hall has been started and stopped a number of times. Work was last stopped on November 21, and will not be resumed until more funds are received. The building was almost completely dismantled in February of last year, and has since been 68 per cent rebuilt. The entire building was razed except a few sections of the walls. The new walls are now complete, and the roof is almost finished. The work is under the supervision of Mr. H. D. Carter, and has so far cost $14,751. When finished the building will be used as a museum and art center for the University.

The reconstruction of the University tennis courts, begun during the winter quarter last year, is still in progress. Almost 15 miles of drainage pipes were laid under the courts, and 22 courts were covered with a surface of asphalt. Two were surfaced with concrete, and the remainder are now being made into clay courts. The pouring of the asphalt on the tennis courts was finished in February, and most of the courts are now in use. These all-weather courts were constructed at a total cost of $20,453.

Early Work on Athletic Field

In spite of frequent interruptions much has been accomplished by the Emergency Relief Administration in Chapel Hill.

THE CAROLINA ENGINEER

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E-D-I-T-O-R-I-A-L

STUDENT ENTERTAINMENT SERIES

Students in the School of Engineering should join with the students of the other schools in sponsoring the Student Entertainment Series. Membership in this group would enable the engineering students to attend cultural and educational entertainments. Since the engineering curriculum can only provide an acquaintance with the fine arts, the engineering students should avail themselves of this opportunity for developing cultural appreciation.

Development of outside interests are necessary for the student to be the all-round engineer that society demands. Lack of outside interests often keeps the trained technician from becoming a finished engineer directing the application of science for the benefit of mankind. The technician knows his tools alone; the real engineer not only has a knowledge of tools, but he can work with men and knows their interests.

It has been the desire for engineers rather than technicians that has led to the stressing of engineering training in universities. The broadening and cultural influence of the university is essential to the all-round development of the engineer. Diversified interests are very important to the young engineer whose hardest job is to sell his services to the employer who often will not even mention engineering in an interview. Besides, from the standpoint of professional development, the Student Entertainment Series provides real diversion from the daily study of formulas and machinery.

However, it is not necessary to point out the advantages of these programs to all the engineering students. A number of them regularly attend the performances of this series, and many of them participate in the so-called cultural extra-curricula activities. It might be surprising to note that one year in a small symphony orchestra on the campus eight of the fifteen members were engineering students.

The point to be made is that by concerted action upon the part of the engineers, they too may enjoy the privilege of attending the programs of the Student Entertainment Series.

UNCLASSIFIED FRESHMAN

Beginning several years ago the engineering school adopted the policy of not classifying students into the four branches of engineering until after the first year. It was felt that usually entering students, though interested in engineering, were not sufficiently familiar with its various branches to make wise selections until after a year of residence. During this year it was thought that the student would become better acquainted with the fields of engineering and so would be better equipped to make his choice of a division.

More often the student does not make a careful investigation of the fields of engineering and thoughtfully make his selection, but drifts on into the field of his first choice without further consideration.

The best introduction to engineering for the student should be through the student professional societies. The freshman should early realize the importance of these societies and attend their meetings. It would be well for him to attend as

many meetings of the different societies as possible. In the brief four years of college the class room must devote itself to fundamentals alone, leaving the societies to illustrate the applications of these fundamentals. Consequently from these societies the student can learn much of the practical side of his profession and thus be aided in his choice of a branch of engineering.

ENGINEER'S DAY

For the past two years the local student chapter of the American Institute of Chemical Engineers has sponsored an annual Chemical Engineer's Day. The purpose of this program has been to focus the attention of all the students of chemical engineering and of the practicing engineers in this state on the activities of this department of the School of Engineering and to have the present conditions and trends of the profession presented to the group by men whose activities have won for them national recognition. In addition to lectures and seminars conducted by the guest speakers, Chemical Engineer's Day programs have included research reports, laboratory inspections, and a banquet preceding the featured public address.

The benefits derived from Chemical Engineer's Day by the school as well as by the sponsoring society indicate the need for expanding this idea to embrace the entire School of Engineering. The Engineering schools of both Duke University and N. C. State College have similar celebrations, the Engineer's Fair at the latter school being a celebration of several day's duration and one to which the entire student body looks forward eagerly. Technical students from these neighboring schools should welcome the opportunity to participate in such a program as has been suggested for Carolina's Engineer's Day.

It has been suggested that each of the four Engineering Societies represented on this campus be responsible for a specific part of the day's activities. A program consisting of lectures by prominent guest speakers and reports on or inspections of the research and laboratory activities of each department seems to be most feasible. With each society providing but one speaker the burden, financial and otherwise, should not prove excessive. The day could easily be divided into two morning and two afternoon sessions with sufficient time between the principal lectures for informal discussions. Under such a plan the attention of all of the engineering students and their guests will be held in turn by each of the four departments of the School of Engineering, and at the conclusion of the program many new interrelations between the different branches of engineering instruction will undoubtedly be apparent.

As a logical means of unifying the departmental programs a banquet in honor of the guest speakers, and attended by all the students and their guests from elsewhere in the state, could be held. Such a social feature coming at the end of the day's technical sessions would provide an excellent opportunity for our guests to see that side of Carolina campus life which is not apparent in lecture rooms. Professional engineers are always interested in learning of the changes made in campus life since their own college days, and students from other schools enjoy making comparisons with their own alma mater.

Following still further the program of the past two Chemical Engineer's Days, the banquet could be followed by a well-advertised lecture to which the entire public is invited. This lecture can be presented by the speaker whose subject has the strongest public interest. If none of the speakers invited for the technical discussions during the day is in a position to present an address of sufficient general interest, a fifth speaker could be secured for this specific purpose. Last year Dr. Harry Curtis spoke on the Tennessee Valley Authority of which he is Chief Chemical Engineer.

Such an Engineer's Day, embracing as it does the entire Engineering School, should have the immediate and complete cooperation of the administration, for it would be far more than a mere holiday from classes. For the students and the practicing engineers of the state it would provide an opportunity to learn of the present status of engineering professions and education from nationally prominent leaders in each field. From an inspection of its facilities and research projects the School of Engineering at Chapel Hill would receive statewide publicity of a most valuable quality, especially in this period of proposed consolidation.

The recent Student-Faculty Day indicated how little a great many of us know about our own University. One of the most frequent criticisms of that celebration has been that its program was too extensive to permit a satisfactory examination of more than a few of the departments of the University. An Engineer's Day would therefore permit the entire student body to examine thoroughly the functions of the School of Engineering.

The A. I. Ch. E., already on record as favoring a continuance of its Chemical Engineer's Day, has voted to postpone action until the matter of a united Engineer's Day can be discussed. With the limited time available in the Spring term, work on any such program that is to be carried out this year must be started at once.—*R. L. H.*

ALUMNI NOTES

Mr. R. H. McLain, a member of the class of 1906, has achieved prominence in the development of electrical machinery for moving materials. He is at present sales engineer of the General Electric Company.

After his graduation, Mr. McLain worked in the testing department of the General Electric Company under the direction of Charles Steinmetz. Two years later he was transferred to the department of engineering design.

His first contact with electrical moving equipment came in 1910 when he became associated with a company which manufactured cranes and other machinery for handling bulky materials. He designed cranes for foundry use, cranes for handling war materials, and handling machinery for coal and ores. Some of the larger projects on which he worked are: the unloading machinery of the Duluth-Superior harbor which unloads 240,000 tons of coal per day, several gun-handling trains with capacities of 300 to 400 tons, log-handling machines for loading freight cars, grain-handling machinery, and passenger and freight elevators.

He became sales manager of the Maine Electric Company in Portland, Maine in 1921, but a year later he resigned to accept the position of sales engineer for the General Electric Company.

He has served as secretary and later as president of the Society of Terminal Engineers, and is on the membership Committee of the A.S.M.E. He is a member of Phi Beta Kappa.

In an interview with a reporter sometime ago, Mr. McLain attributed his success to good luck. During the interview he was most interested in talking about camping, hunting, and mountaineering in North Carolina.

Tommy Taylor, '32, expects to get his Ph.D. this coming June from M.I.T. Since graduation here he has held a fellowship at M.I.T. and has been doing research on distillation. He will be remembered as the Chemical Engineer who was Vice-President of Phi Beta Kappa and a member of Tau Beta Pi.

W. G. Miller, an electrical graduate in the class of '33, is working with Westinghouse now.

Bob Cowhig, a mechanical in '33, is working in the Federal Reserve Bank in Charlotte, N. C.

A. C. Furchgott, another mechanical in '33, is with the Eastern Air Line. He is located in New Orleans.

Fred Culvern, one of last year's graduates in civil engineering, is now transitman with the AAA. He is working near MacBee, S. C. For the first two quarters of this year, Fred was doing graduate study here. He was the holder of a graduate fellowship for this year.

W. C. Morrison, a member of the present senior civil class, did not return to school after Christmas. He is working in a bank on Wall Street.

William Perry, graduated in Chemical Engineering in '30, accepted a position with the E. I. du Pont de Nemours Co. After two years he returned to the South, and became a chemist for the R. J. Reynolds Tobacco Co. in Winston-Salem.

Robert M. Watt, graduate in electrical engineering of the class of 1909, has been elected president of the Kentucky Utilities Company, a concern that serves 360 communities through its extensive system of electric, gas, water, and transportation facilities. Following his graduation from the University, Mr. Watt was employed by the Commonwealth Edison Company, Chicago. In 1912, he became associated with the Kentucky Utilities Company, and has served the company in an executive capacity since that time.

Life Infinitesimal

By Wilbur Kochtitzky

The smallest living organism visible to man is the bacterium. The common bacillus found in infusions of dead organic matter may be called an average bacterium. It is shaped like a rod about one micron wide (one thousandth of a millimeter or about one twenty-five thousandth of an inch) and about five or eight times as long. Of course some bacteria are larger than this and some are very much smaller. If it can be imagined that one of these average bacteria and an ordinary man were enlarged in the same proportions, when the bacteria reached the size of a cigar four inches long and one half inch in diameter the man would be fifteen miles high.

The anatomy of a bacterium is very simple, not even having a nucleus, but in effect being only a quantity of protoplasm having definite shape. Its life-cycle is likewise simple. It grows and proliferates with incredible rapidity, the average length of life in favorable conditions being about twenty minutes (between successive divisions). The reproduction is effected by fission (dividing or splitting into two of the organisms) and there is no trace of a sexual stage in the life-history, but the fission can go on indefinitely unless some environment interferes. And even then by turning into a resistant, tough-walled spore it may in many cases survive.

Spores may live in boiling water for several hours, whereas active bacteria are killed at once. Similarly, spores have lived at the temperature of liquid air (—190°C.) for six months. Some spores have been kept three years and revived fully active. A man in a dormant state as long in proportion to the length of his life would sleep for over two and a half million years. In the spore form bacteria lie dormant practically everywhere in the world. Upon entering favorable environment they may again become active.

The large number of different kinds of bacteria usually fall into three groups according to the shapes of their bodies. The rod-shaped bacterium is called a bacillus (or stick), a spherical one is a coccus (or berry), and a curved or wriggling one is a spirillum.

Since the large number of different kinds of bacteria are confined to a very limited number of bodily forms which they may have it is natural to assume that their physiology is very diversified. Some bacteria get energy by oxidizing simple inorganic compounds (for example oxidizing hydrogen sulfide into sulfuric acid), some produce sulfuric acid from sodium thiosulphate, some burn ammonia, and some can even live without oxygen.

In the 17th century microscopes were sufficiently developed to permit observation of such minute forms of life. In 1683, Leeuwenhoek, a Dutch lens-maker, constructed a combination of lenses and observed bacteria in tartar from teeth and in various decaying substances. Since some of these seemed to move he considered them animals and called them "animalcules." In the next century the compound microscope was developed and in 1773 Muller, a Dane, made the first classification of microscopic living things. In 1762 Plenciz advanced a theory of germ causation of disease but it remained for Davaine in 1863 to establish it by satisfactorily demonstrating the relation between microörganisms and anthrax disease. His results were checked by Koch later and similar results with silk worm disease were gotten by Pasteur. About the middle of the 19th century the theory of spontaneous generation was disrupted by the work of Schröder and Dusch in 1854, Pasteur in 1860, and Tyndall, and it was proven that life must come from pre-existing life. Pasteur about the same time definitely established the germ theory of fermentation and decay. In 1836 Ehrenberg, a German, published a book on protozoa giving a very complete classification of microscopic forms. The German botanist Cohn (1872-1876) worked out the first reasonably complete classification of bacteria as a distinct group of plants rather than of animals as had been previously supposed. His publications are generally regarded as the beginning of the development of modern bacteriology.

To the layman bacteria are usually considered simply as germs which cause diseases. While this type of bacteria is numerous and very important, it must not be overlooked that there are very many beneficial bacteria. The decay of dead plants and bodies is largely due to bacteria. Bacteria are plentiful in the soil. They extract nitrogen from the atmosphere and from organic matter and make it available to the soil from which it passes on to the plants. They attack the roots of leguminous plants, thereby imparting fertilizing properties to them. Most of the odors in the world are due to microscopic organisms, even some of the most delicate perfumes deriving odors from them. The flavor of wine is dependent upon the type of bacteria in it. The flavor (and even the air holes) of cheeses depend on the bacteria and yeast. Many of the processes in the leather industry are bacterial actions. And the fermentation of beer is dependent upon bacteria.

Perhaps the most important bacterial function

(*Continued on page Fifteen*)

THE DEAN'S PAGE

The Two General Functions of Engineering Education

By ACTING-DEAN WM. J. MILLER

The public in general and some engineering students have the erroneous idea that the sole purpose of the engineering curriculum is to prepare a student for the practice of a specific field of engineering. This is no doubt due to the general lack of information essential to a clear understanding of engineering education. A few facts with regard to the nature of the engineering curriculum and the values that graduates have derived from engineering education may be helpful to those interested.

ACTING-DEAN MILLER

The undergraduate engineering curriculum at the University of North Carolina, which is fairly representative of engineering education in general, compromises three types of courses: first, Arts and Science courses not taught in the Engineering School; second, general application of science courses and third, specific engineering courses. The second and third types of courses are taught by the engineering faculty. The Arts and Science courses constitute 45% of the total work required for the engineering degree. The general application of science courses are 19% of the total and the strictly engineering courses amount to only 36% of the total requirements.

The approximately 65% of the curriculum, in effect devoted to Arts and Science and general application of science subjects, amounts in quantity to nearly 90% of the work required for a bachelor of arts degree. From this it can be seen that there is much more of general education than specialization in engineering in the present engineering curriculum.

A student who completes the engineering course of study is graduated with a sound, well coordinated undergraduate college education, and in addition, a training in the fundamental theories and applications of engineering. If he finds himself sufficiently interested in and adapted to engineering he may seek employment in which he may acquire practical experience which will lead him in time into the practice of engineering as a profession. On the other hand if he does not find sufficient interest in or adaptability to engineering, he may turn to the general field of commercial industry and seek any employment that might be open to college graduates in general.

An engineering graduate who does not become employed in technical engineering activities has in no sense lost the main value of his University education. The consensus of opinion of 2500 engineering graduates (out of college 5 to 40 years) from 34 institutions, in response to the question of what had proved to be of most value to them in their college experience, was that "discipline in methods of thinking and habits of work" come first while "direct training in engineering" was rated fourth in importance. Regardless of the type of work that an engineering graduate may take up, that part of his training which has been found most valuable by wide experience is available for full use. Thus it is that an engineering graduate has an option of going into engineering as a profession or of entering the general commercial field of industry with the assurance that his development in the engineering curriculum will serve him effectively.

A study of the records of the above 2500 engineering graduates shows that seven out of ten were engaged in other than strictly technical engineering work. Approximately 80% of the graduates not following technical work were engaged in duties that were chiefly executive, administrative and managerial in nature. From this and many other reports showing the same situation it is safe to conclude that engineering with its emphasis on accuracy, thoroughness, exact analytical thinking, and systematic work, develops in the student habits and an attitude of mind which are highly desirable in the make-up of a successful executive.

In a recent publication of the University of Michigan, Dean H. C. Sadler, of the College of Engineering states: "There seems to be an in-

creasing demand for a fundamental engineering training, not particularly specialized, as a basis for preparation for other professions; somewhat analogous to that of literary colleges. It would appear, therefore, that the engineering college will have two functions to perform: one to train men who expect to enter the professional or research field, and the other as a basic training for other professions or walks of life generally."

All of this leads to the logical conclusion that the student who enters the engineering school need not feel that his career will be limited by the opportunities that may exist solely in the field of engineering that he proposes to study, but that the training peculiar to the curriculum will prepare him also for fruitful achievements in many other fields of endeavor.

THE VALUE OF ECONOMICS TO THE ENGINEER

(*Continued from page Four*)

hand, deals with an infinitely more prosaic question, namely, with the question: will it pay? Theoretically technics can plan without regard to available financial means. The very essence of economics is to weigh output against input. It must never plan without due regard to actually existing means.

To sum up this phase of my discussion, I may say that the study of economics should impress upon the engineer the fact that it is impossible to approach all phenomena with the tools and techniques of exact science, that some of the most basic concepts in the field of the social sciences are utterly and inescapably unfit for slide-rule treatment. Secondly, he may learn that enthusiasm to do big things for their own sake may be carried too far and that the ultimate contribution of the engineer to social progress will be and must be measured in terms of net rather than of gross additions.

Lest I be misunderstood I should explicitly state that I am aware that many engineers are not only thoroughly conversant with economics but have demonstrated by their own actions that they are keenly aware of its inner implications. I would also add at this point that division of labor between the professions may obviate the necessity of individual engineers broadening out into the field of economics. I would modify this, however, by saying that the greater the responsibility which an engineer takes upon himself the greater seems to me to be the need of his personally being aware of the deeper implications of economic thinking.

Closely allied with this first observation is the second point that I wish to make, that is, that the study of economics is apt to awaken in the engineer a keener sense of social consciousness. Let us return to the example of the N. Y. State Barge Canal, the revised edition of the old Erie Canal. By this time the wealth sunk into this engineering project is probably not much less than a quarter of a billion dollars. This enormous sum is yielding very little return to the society which was called upon to divert its surplus funds into this venture. Indeed the very fact that this enormous investment annually yields considerably less than the minimum which could reasonably be expected from works of such magnitude continuously adds to the social loss involved. I wish that our engineers, at least the elite of our engineers, would develop a sense of social consciousness keen enough to realize how wrong such a misapplication of public funds is. It is too much to expect that all members of a profession sacrifice themselves on the altar of a vaguely conceived common weal. It might, however, not be too much to expect that they expose themselves during the formative period of their lives to thought streams which may help them to see more clearly the social consequences of their works. Why is the study of economics particularly well adapted to the purpose of awakening or strengthening this social consciousness? The answer is simple. Far from being the study of the ways and means by which individuals can enrich themselves in utter disregard for or even at the expense of their fellowmen, economics concerns itself above all with the critical appraisal of entire economic systems, proceeding in this critical appraisal from individual interest on to social welfare. It is axiomatic that an economic system which in the long run fails to promote the welfare of society as a whole sooner or later will have to yield to a system that will. Unless exposed to this line of thought, the engineer concerned with ways and means of building and operating factories, highways, railroads, etc., is apt to fail to see the inner and deeper meaning of the part he is called to play in society; he is apt to overlook the woods because of too many trees; he is apt to think within narrow segments unaware of the fact that the segments make the circle. I do not wish to imply that we economists have a monopoly on discovering the circle. In fact, I fear that many economists are not aware of its existence. That, however, should not deter the engineer from trying to find it. Those most versed in both technics and economics are apt to see it first.

Engineering courses were first offered at the University in 1852 when Charles Phillips was made Professor of Civil Engineering in the "School for the Application of Science to the Arts."

ACTIVITIES OF THE SOCIETIES

A. I. Ch. E.

The local student chapter of the A. I. Ch. E. met on November 27 to hear an interesting lecture on polarized light given by Dr. Borgmann of the Chemical Engineering Department. Dr. Borgmann illustrated his lecture with a polarimeter, an instrument which is used to measure the effect of optically active substances on polarized light, i.e., light which vibrates in only one plane. At the close of Dr. Borgmann's lecture refreshments were served and the meeting was adjourned.

The meeting on December 12 was opened with a short business discussion. After the business was attended to a series of slides depicting the Dopp kettle were shown while President Huber read the accompanying lecture.

The first meeting of the winter quarter was devoted to business. Plans for the Engineer's Ball and for Chemical Engineer's Day were discussed.

Another business meeting was held on February 28 for the purpose of making further plans for Chemical Engineer's Day. Possible speakers were suggested and the type of program was considered.

A. S. M. E.

The student branch of the A. S. M. E. held a meeting on February 14. At this meeting Mr. Walter Van Haitsma, who is in charge of placement at the Boeing School of Aeronautics, gave a program which consisted of a talk on recent developments and the vocational aspects of the aviation industry, and included the following films:

1. A historical film, showing the development of airplanes from the Wright brothers' to the new Boeing 247 Transport.
2. A film of the combined Pratt & Whitney engine and Boeing Airplane.
3. A Boeing School film showing flight and ground training methods and the equipment and facilities offered here for the training of United Air Lines personnel.
4. A film entitled, "Across the Continent in Twenty Hours," showing United Air Lines operations and a coast to coast flight.

This meeting was well attended and everyone present evinced much interest in the program.

On Sunday, March 24, J. M. Rennie, L. S. Tracy, R. B. Wilson, J. D. Maynard, and Mr. Colin Carmichael, Honorary Chairman, went to Knoxville, Tenn. to attend the fourth student meeting of the A. S. M. E. The program began the following Monday with a visit to the plant of the Aluminum Co. of America at Alcoa, Tenn. Then luncheon was had with the Knoxville Technical Club at the Hotel Andrew Johnson. In the afternoon the members heard papers presented by the student delegates from various schools. Monday's activities were closed with a banquet at the Hotel Andrew Johnson and a dance in Alumni Memorial Hall at the University of Tennessee. On Tuesday morning more technical papers were presented. Mr. R. B. Wilson represented the University of North Carolina with his paper on "A Simple Method of Testing the Discharge Efficiency of an Air Compressor." After luncheon a trip to Norris, Tenn. was made. At Norris the construction of the Norris Dam was inspected, a T. V. A. sound film was viewed, and supper was served at the Norris Cafeteria. The entire meeting in Tennessee was a success and the representatives from the University of North Carolina found the trip to be pleasant and profitable in every respect.

A. I. E. E.

The meeting of the local chapter of the A. I. E. E. on November 22 was opened with a discussion of several business matters. Councilor Miller then explained the requirements for presentation of student papers and stressed the benefits to be received from their presentation. Dean Miller was followed by R. Van Sleen who gave a very interesting talk on the history, development, and activities of W4WE, the local amateur radio station. The intellectual part of the program was brought to a close with an interesting lecture by Mr. J. E. Lear on the application of electric motors to filtration and sewage disposal. When Mr. Lear concluded refreshments were served in the machine laboratory.

On January 24, after a brief business discussion, the chapter heard Louis Hagood speak on "The Murry Lake Power Development." The talk included a discussion of power facilities in South Carolina. After Hagood's talk, a motion picture of the Conowingo power development was shown and the members adjourned to the machine laboratory for refreshments.

At the next meeting, on February 6, Mr. Winkler of the Department of Electrical Engineering gave an enlightening comparison of the cost of hydro-electric and steam power. Mr. Hershey, of the senior electrical class, gave a talk on the sodium vapor lamp of highway illumination. Mr. Hershey illustrated his lecture with slides.

A. S. C. E.

The A. S. C. E. student chapter held a meeting on December 7 at which J. A. Westbrook delivered an illustrated talk on the Hetch-Hetchy Water Supply and Power Development. At the conclusion of Westbrook's interesting lecture minor business matters were attended to. President McNairy presided at the meeting.

At the meeting on January 17, Dr. A. M. White, head of the Department of Chemical Engineering, gave a talk about the chemical industries. After Dr. White had finished speaking, an election was held to fill the office of secretary left vacant by the failure of W. C. Morrison to return to school. P. L. Onasch was elected.

TAU BETA PI

Tau Beta Pi, national honorary engineering fraternity, gave its winter initiation banquet at the Carolina Inn on February 22, preceding the Engineer's Ball. The banquet was very well attended by students accompanied by their dates and by faculty members. Forty-six people were present.

Mr. Carl Goerch, editor of "The State," was the principal speaker of the evening. He related many of the interesting stories he has discovered in traveling through North Carolina. Professor "Pop" Hoefer, head of the Mechanical Engineering Department, furnished the "ad. lib." part of the program by delivering some jokes at the expense of the seniors. The two new men, Angus Davis and Tom Gordy, who were elected to membership in the winter quarter, were introduced.

The fall initiates constructed a wooden bent of the Tau Beta Pi emblem for which a lighted case has subsequently been made. Permission to hang the lighted emblem in the hall of the engineering building is being sought.

The winter initiates made a chart entitled, "The Road Map of Engineering," which was exhibited in the doorway of Phillips Hall on Student-Faculty Day. This map shows the various fields of activity to which the four main branches of engineering lead.

ALPHA CHI SIGMA

The members of Alpha Chi Sigma, professional chemical fraternity, and their dates attended a dinner at Graham Memorial on February 23. Informal talks were given by student and faculty members.

The chapter has recently announced an award of a copy of Lange's "Handbook of Chemistry" to be presented each year to the freshman chemist or chemical engineer who has made the highest scholastic average of the first two quarters of the freshman year.

Next year, the chapter plans to begin a series of annual lectures. At least one nationally prominent authority on some phase of chemistry will be brought to the University each year.

On April first the chapter pledged the following men: D. E. Eskew, J. E. Everett, R. C. Jurney, S. B. Knight, A. R. Macormac, P. M. Nicholes, and W. G. Sink.

TAU BETA PI AWARD

The local chapter of Tau Beta Pi recently announced the establishment of an annual award for freshmen in engineering. The award is to be a Log Log Duplex slide rule, and will be presented in the fall quarter to the sophomore in engineering who finished his freshman year with the highest scholastic average.

STAFF MEMBERS TO RECEIVE KEYS

Staff members of *The Carolina Engineer* decided upon the design of their key at the last meeting of the group. The design chosen is a vertical gear interlocking a smaller horizontal gear, with a pen and scroll in the center of the vertical gear. The keys will be made of yellow gold, and will be awarded to meritorious workers of the editorial and business staff.

LIFE INFINITESIMAL

(*Continued from page Eleven*)

of all is putrefaction. This is usually considered a nuisance but, on the other hand, it is a vitally important process. Sewage disposal processes depend on bacterial decomposition. The quantities of various chemicals available in the world are limited. If matter became perfectly preserved after death these quantities would soon be exhausted. However, by means of bacteria and their effects on the nitrogen, sulfur, and carbon cycles, these substances are dislodged and made available to other forms of life thus keeping the quantities available practically constant. So bacteria should be looked upon not simply as germs causing diseases but mainly as organisms absolutely essential to the preservation of life.

The Testing Machine

The 200,000-lb. testing machine in the mechanical engineering laboratory is one of three built by the War Department during the World War. At that time it was used to test airplane struts. After the war it was given to the University School of Engineering. The well in which this testing machine is set was at one time the source of the water supply for the University.

Rockefeller Choice

The University is one of two schools to which the Rockefeller Foundation usually sends graduate students in sanitary engineering. The other school is Harvard University.

Naval Research

Dr. H. D. Crockford is doing research work on storage batteries with the aid of the United States Naval Research Laboratory, Washington, D. C. He has recently received electrical equipment valued at $500 for the purpose of further research in the field of electrochemistry.

Equipment from Rockefeller Foundation

The Rockefeller Foundation provided the University with much of the apparatus used in research studies. Some of this equipment is owned by the engineering department, but is not used as a part of the regular laboratory equipment. One interesting piece of apparatus is the Begg's deformeter, which is used to test deformations of models set up to scale. This deformater may be used to find moments and reactions of rigid structures. Another valuable piece of apparatus is the Huggemberger tensiometer, which is a small instrument used to measure strains. It has a 2-inch gage length, and is the smallest type in the world.

Hostilities Suspended Temporarily

Two engineering professors claimed to have originated a novel idea of cleaning the terminals on the electrical switchboard. The idea under dispute was described as follows: The terminals were to be cleaned by the use of an electric drill which revolved a piece of emery paper on the surface to be cleaned. Both professors laid claim to the idea, but they have agreed to suspend hostilities so that they may enjoy the beautiful spring weather.

Wooden Water Mains

The mains carrying the water supply of Chapel Hill were once made of wood for the sake of economy. After a while, however, they began to leak in various places. Locating these leaks was easy because in the summer grass grew tall over the leaks, and in the winter steam could be seen rising out of the ground from a leaking pipe.

The Old Town Generator

The electrical engineering laboratory is now operating a direct-current generator which was the sole source of electrical supply for the town of Chapel Hill 25 years ago. In 1910 it was replaced by a larger generator, and was moved to the fire station for storage. In 1916 Mr. Lear salvaged the generator for the electrical laboratory where it is still in use.

Dr. Wheeler's Research

Dr. Wheeler, authority on para-cymene, is doing research with the aid of the Rockefeller Research Fund. In the experimental work on para-cymene a number of new dyes and new compounds of physiological interest have been discovered.

Engineering Student Performs Daring Feat

While returning from a picnic which had been broken up by a threatening thunderstorm, H. C. McBrair, senior electrical engineering student, bravely carried his female companion across the raging Haw River. The weather bureau states that the maximum depth of the river at this point was 2.5 feet! When asked to comment on his daring rescue, Mr. McBrair said: "In my case and in others—engineering foresight and thoroughness triumphed over all difficulties."

Engineer to Lead Luxurious Life

It was recently announced that P. G. Jamison, engineering student, will drop two courses during the spring quarter so that he will be able to devote more time to outside activities. The exact nature of the activities has not yet been disclosed, but will probably be revealed at an early date.

The First Student

The first student to enter the University, Hinton James, became an engineer.

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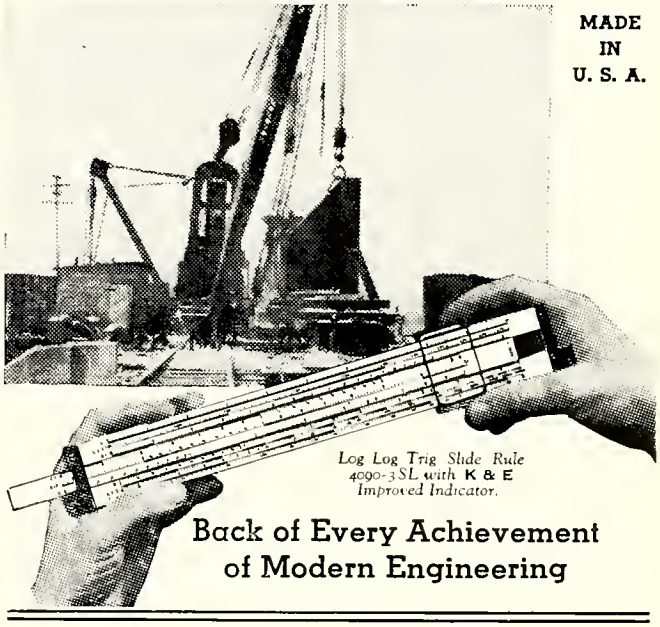

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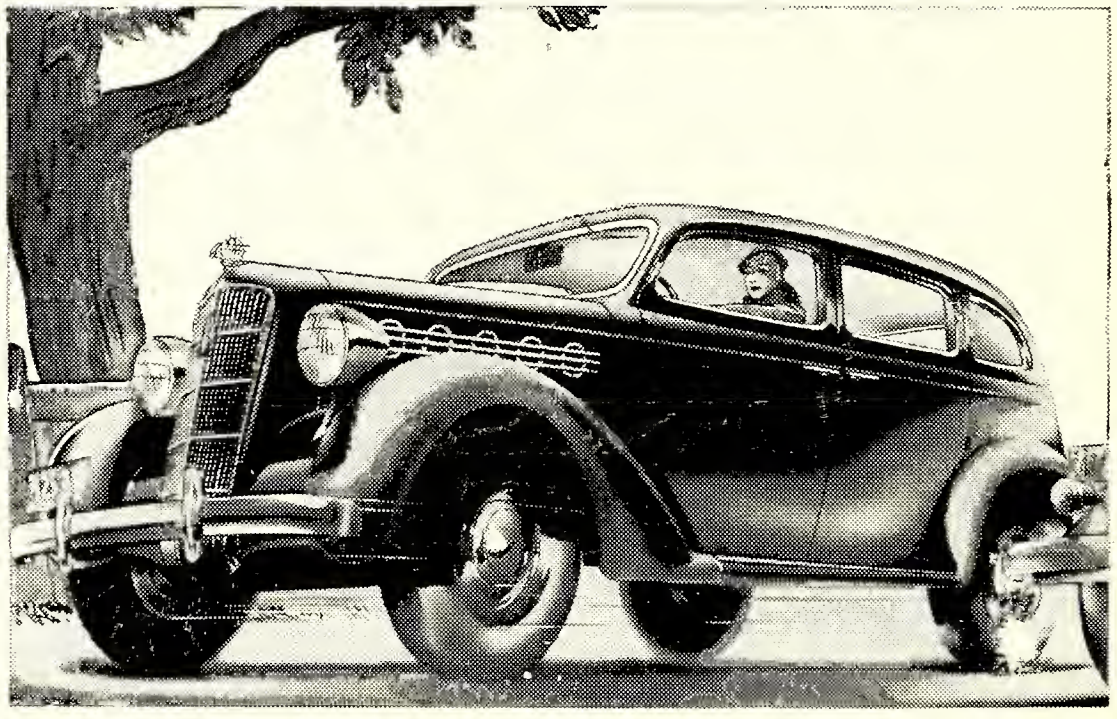

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